

## MU2QM-F

### MULTIMETER, DIGITAL

1. **GENERAL.** This procurement requires a solid-state, 5-1/2 digit, true rms multimeter designed for laboratory and field use.

2. **CLASSIFICATION.** Type II, Class 5, Style E, and Color R in accordance with MIL-T-28800 for shipboard applications.

3. **MEASUREMENT CAPABILITIES.** The equipment shall be capable of measuring ac and dc voltages and resistances within the ranges and accuracies specified below. The equipment shall respond to the true rms value of ac signals. All measurement functions shall be auto-ranging with selectable manual range control.

3.1 **Voltage measurements.** The minimum full-range ac and dc voltage measurement capability shall be as follows:

a. AC: 2 to 700V in selectable ranges with a sensitivity and resolution of at least 10  $\mu$ V on the lowest range.

b. DC:  $\pm 0.2$  to 1,000V in selectable ranges with a sensitivity and resolution of at least 1  $\mu$ V on the lowest range. Polarity shall be automatically sensed and displayed.

3.1.1 Voltage accuracy. The ac and dc voltage accuracies shall be within those specified in table I after a measurement time (response time) not to exceed three seconds.

TABLE I. Accuracies

Function	Range	Accuracies $\pm$ (% Reading + # of Counts)
DC Volts	200 mV to 1,000V	0.015 + 5
AC Volts 50 to 100 Hz 100 Hz to 20 kHz	2 to 700V 2 to 700V	0.4 + 100 0.3 + 75
Ohms	All except 20M 20M	0.1 + 10 0.5 + 10

3.1.2 **Voltage accuracy temperature coefficient.** The temperature coefficients shall not exceed those specified in table II.

TABLE II. Temperature Coefficients

Function	Range	Coefficients $\pm$ (% Input + # of Counts)/°C
DC Volts	200 mV to 1,000V	0.007 + 3
AC Volts 50 to 20 kHz	2 to 700V	0.5 + 20
Ohms	200 ohms to 20 megohms	0.02 + 5

**3.1.3 Noise rejection.** The dc input noise rejection ratios shall be as specified below:

- a. CMR: 110 dB at dc, 50 and 60 Hz with 1 kilohm in either input lead.
- b. NMR: 30 dB at 50 and 60 Hz.

**3.1.4 Maximum input.** Dc volts ranges: 1,000 Vdc or peak ac. AC volts ranges: 700 Vrms, 1,000V peak or  $2 \times 10^7$  volts-hertz product, whichever is less.

**3.2 Resistance measurements.** The full range resistance measurement capability shall be from 200 ohms to 20 megohms in selectable ranges.

3.2.1 Resistance accuracy. The resistance accuracies shall be within those specified in table I after a measurement time (response time) not to exceed four seconds.

3.2.2 Resistance accuracy temperature coefficient. The temperature coefficients shall not exceed those specified in table II.

3.2.3 Open-circuit voltage. 13V maximum.

3.2.4 Current through the unknown resistance. 2 mA maximum.

3.2.5 Resistance input protection. All resistance ranges shall have input protection from applied voltages of at least 250 Vrms.

**3.3 Display.** The equipment shall be provided with the following displays:

- a. Digital readout: A 5-1/2 digit LED, LCD, or a vacuum fluorescent display.
- b. Excess input indication.
- c. Automatic dc polarity indication.

**3.4 Inputs.** The equipment shall have two input terminals for voltage measurements and four input terminals for resistance measurements. The common input terminal shall be capable of withstanding voltage potentials of  $\pm 500$  Vdc referenced to ground potential.

3.4.1 Input impedance.

- a. AC voltage function: At least 1 megohm shunted by 100 pF or less.
- b. DC voltage function: At least 10 megohms on all ranges.

#### **4. GENERAL REQUIREMENTS.**

4.1 **Power source.** MIL-T-28800 nominal power source requirements are invoked. Maximum power consumption: 20W.

4.2 **Weight.** 5 kg (11 lb) maximum.

4.3 **Digital interface.** A digital interface is required in accordance with MIL-T-28800.

4.4 **Lithium batteries.** Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

4.5 **Accessories.** The equipment shall be provided with safety-designed banana plug test leads in accordance with MIL-T-28800.